VLWIR nBn Detectors Based on InAsSb Metamorphic Superlattices

Completed Technology Project (2017 - 2019)

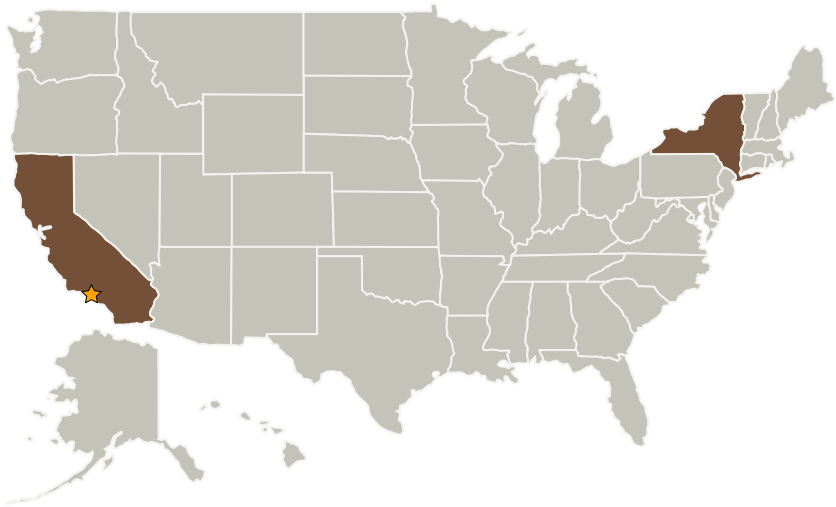
Project Introduction

Demonstrate high quality InAsSb metamorphic superlattices with cut-off wavelength of 12 and 16\xb5m.\nValidate high absorption and large hole mobility in these superlattices.\nDemonstrate high quantum efficiency nBn photodetector based on the new metamorphic superlattices.

Anticipated Benefits

Very long wavelength infrared (upto16 \xb5m, VLWIR) detectors are of great interest for Earth and Planetary Science missions such LandSat, EON-IR, NSOSA, etc. Even a modest increase in detector operating temperatures from the current 30-40K to 50-70K will provide great benefits to instrument development by reducing the size, weight and power (SWaP). Especially important for CubeSat/SmallSat. Even a modest increase in detector operating temperatures from the current 30-40K to 50-70K will provide great benefits to instrument development by reducing the size, weight and power (SWaP). This is especially important for CubeSats/SmalSats.

Primary U.S. Work Locations and Key Partners



VLWIR nBn Detectors Based on InAsSb Metamorphic Superlattices

Table of Contents

Center Innovation Fund: JPL CIF

VLWIR nBn Detectors Based on InAsSb Metamorphic Superlattices

Completed Technology Project (2017 - 2019)

Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Stony Brook University	Supporting Organization	Academia	Stony Brook, New York

Primary U.S. Work Locations	
California	New York

Project Transitions

October 2017: Project Start

September 2019: Closed out

Closeout Summary: Very long wavelength infrared (up to 16 µm, VLWIR) detectors are of great interest for Earth and Planetary Science missions such LansdSat, AIRS), etc. IR detectors utilizing type-II superlattices, such as InAs/GaSb lattice-matched to GaSb, require superlattices with a large period to cover VLWIR bands. This results in lower absorption and poor hole transport that decreases photodetector responsivity. Recently invented InAsSbx/InAsSby superlattices grown on metamorphic buffers improves dramatically the absorption coefficient and hole transport in the absorber, opening a promising way for realization of high-performance VLWIR nBn photodetectors . This task built and evaluated the performance of a high quantum efficiency nBn photodetector based on the new metamorphic superlattices.

Project Website:

https://www.nasa.gov/directorates/spacetech/innovation_fund/index.html#.VQ

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Center / Facility:
Jet Propulsion Laboratory (JPL)

Responsible Program:
Center Innovation Fund: JPL CIF

Project Management

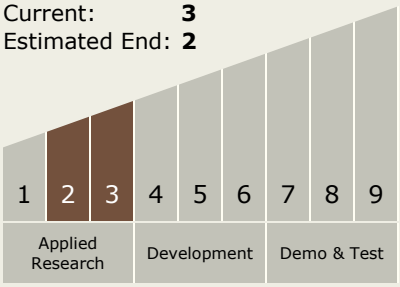
Program Director:
Michael R Lapointe

Program Manager:
Fred Y Hadaegh

Principal Investigator:
Sarath D Gunapala

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **2**



VLWIR nBn Detectors Based on InAsSb Metamorphic Superlattices

Completed Technology Project (2017 - 2019)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

Target Destinations

The Sun, Earth, Others Inside the Solar System